

Ex Parte Presentation

Wireless Strategies Inc.

WTB Docket No. 07-121

Wireless Strategies Inc.

November 14, 2007

Topics

WTB 07-121

Other (applications)

Summary

WTB 07-121 and Part 101

Part 101 (and before that Parts 21 and 94) of the Rules has Demonstrated Without Question the Ability to:

- ❖ Protect Fixed Microwave Services from Harmful Interference
- ❖ Promote the Effective Use of Spectrum

Rule 101.115

§ 101.115

47 CFR Ch. I (10-1-06 Edition)

ANTENNA STANDARDS

Frequency (MHz)	Category	Minimum beamwidth to 3 dB points ¹ (included angle in degrees)	Minimum antenna gain (dBi)	Minimum radiation suppression to angle in degrees from centerline of main beam in decibels							
				5° to 10°	10° to 15°	15° to 20°	20° to 30°	30° to 100°	100° to 140°	140° to 180°	
932.5 to 935	A	14.0	n/a	n/a	6	11	14	17	20	24	
	B	20.0	n/a	n/a	n/a	6	11	14	17	20	
941.5 to 944	A	14.0	n/a	n/a	6	11	14	17	20	24	
	B	20.0	n/a	n/a	n/a	6	10	13	15	20	
952 to 960 ^{2,3}	A	14.0	n/a	n/a	6	11	14	17	20	24	
	B	20.0	n/a	n/a	n/a	6	10	13	15	20	
1,850 to 2,500 ⁴	A	5.0	n/a	12	18	22	25	29	33	38	
	B	8.0	n/a	5	18	20	20	25	28	36	
3,700 to 4,200	A	2.7	36	23	29	33	36	42	55	55	
	B	2.7	36	20	24	28	32	32	32	32	
5,925 to 6,425 ⁵	A	2.2	38	25	29	33	36	42	55	55	
	B	2.2	38	21	25	29	32	35	39	45	
5,925 to 6,425 ⁶	A	2.2	38	25	29	33	36	42	55	55	
	B	2.2	38	20	24	28	32	35	36	36	
6,525 to 6,875 ⁶	A	2.2	38	25	29	33	36	42	55	55	
	B	2.2	38	21	25	29	32	35	39	45	
6,525 to 6,875 ⁶	A	1.5	n/a	26	29	32	34	38	41	49	
	B	2.0	n/a	21	25	29	32	35	39	45	
10,550 to 10,680 ^{6,7}	A	2.2	38	25	29	33	36	42	55	55	
	B	2.2	38	20	24	28	32	35	35	39	
10,550 to 10,680 ⁷	A	3.5	33.5	18	24	28	32	35	55	55	
	B	3.5	33.5	17	24	28	32	35	40	45	
10,565 to 10,615	n/a	360	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
10,630 to 10,680 ⁸	n/a	3.5	34	20	24	28	32	35	36	36	
10,700 to 11,700 ⁹	A	2.2	38	25	29	33	36	42	55	55	
	B	2.2	38	20	24	28	32	35	36	36	
12,200 to 13,250 ⁹	A	1.0	n/a	23	28	35	39	41	42	50	
	B	2.0	n/a	20	25	28	30	32	37	47	
17,700 to 18,820	A	2.2	38	25	29	33	36	42	55	55	
	B	2.2	38	20	24	28	32	35	36	36	
18,920 to 19,700 ¹⁰	A	2.2	38	25	29	33	36	42	55	55	
	B	2.2	38	20	24	28	32	35	36	36	
21,200 to 23,600 ^{7,11}	A	3.3	33.5	18	26	26	33	33	55	55	
	B	3.3	33.5	17	24	24	29	29	40	50	
24,250 to 25,250 ¹⁰	A	2.8	38	25	29	33	36	42	55	60	
	B	2.8	38	20	24	28	32	35	38	45	
31,000 to 31,300 ^{12,13}	n/a	4.0	38	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
38,600 to 40,000 ¹⁴	A	n/a	38	25	29	33	36	42	55	55	
	B	n/a	38	20	24	28	32	35	36	36	
71,000 to 76,000 (co-polar) ¹⁵	N/A	1.2	43	35	40	45	50	50	55	55	
71,000 to 76,000 (cross-polar) ¹⁵	N/A	1.2	43	45	50	50	55	55	55	55	
81,000 to 86,000 (co-polar) ¹⁵	N/A	1.2	43	35	40	45	50	50	55	55	
81,000 to 86,000 (cross-polar) ¹⁵	N/A	1.2	43	45	50	50	55	55	55	55	
92,000 to 95,000	N/A	0.6	50.0	36	40	45	50	55	55	55	

¹ If a licensee chooses to show compliance using maximum beamwidth to 3 dB points, the beamwidth limit shall apply in both the azimuth and the elevation planes.
² Except for Multiple Address System frequencies listed in § 101.147(b)(1) through (b)(4), where omnidirectional antennas may be used.

³ Antennas used at outlying stations as part of a central protection alarm system need conform to only the following 2 standards:

(i) The minimum on-beam forward gain must be at least 10 dBi, and
 (ii) The minimum front-to-back ratio must be at least 20 dB.

⁴ Omnidirectional antennas may be authorized in the band 2150-2160 MHz.

⁵ These antenna standards apply to all point-to-point stations authorized after June 1, 1997. Existing licensees and pending applicants on that date are grandfathered and need not comply with these standards.

⁶ These antenna standards apply only to DCSIS User Stations licensed, in operation, or applied for prior to July 15, 1993.

⁷ Except for antennas between 140° and 180° authorized or pending on January 1, 1993, in the band 10,550 to 10,565 MHz for which minimum radiation suppression to angle (in degrees) from centerline of main beam is 36 decibels.

⁸ These antenna standards apply only to DCSIS User Stations licensed, in operation, or applied for prior to July 15, 1993.

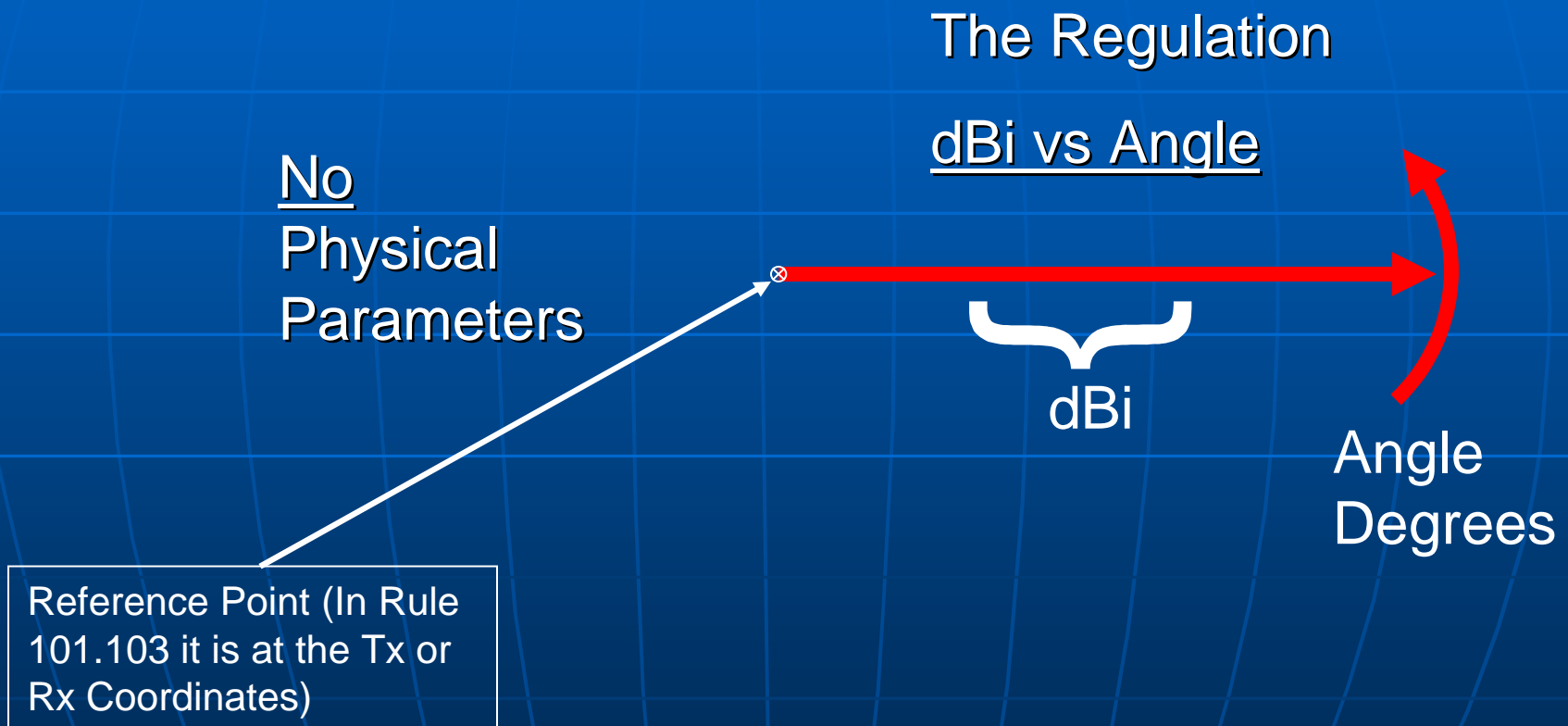
⁹ Except for Temporary-fixed operations in the band 13200-13250 MHz with output powers less than 250 mW and as provided in § 101.147(g), and except for antennas in the MVDDS service in the band 12.2-12.7 GHz.

WTB Docket No 07-121

Rule 101.115

Minimum radiation suppression to angle in degrees from center-line of main beam in decibels							
Minimum antenna gain (dbi)	5° to 10°	10° to 15°	15° to 20°	20° to 30°	30° to 100°	100° to 140°	140° to 180°

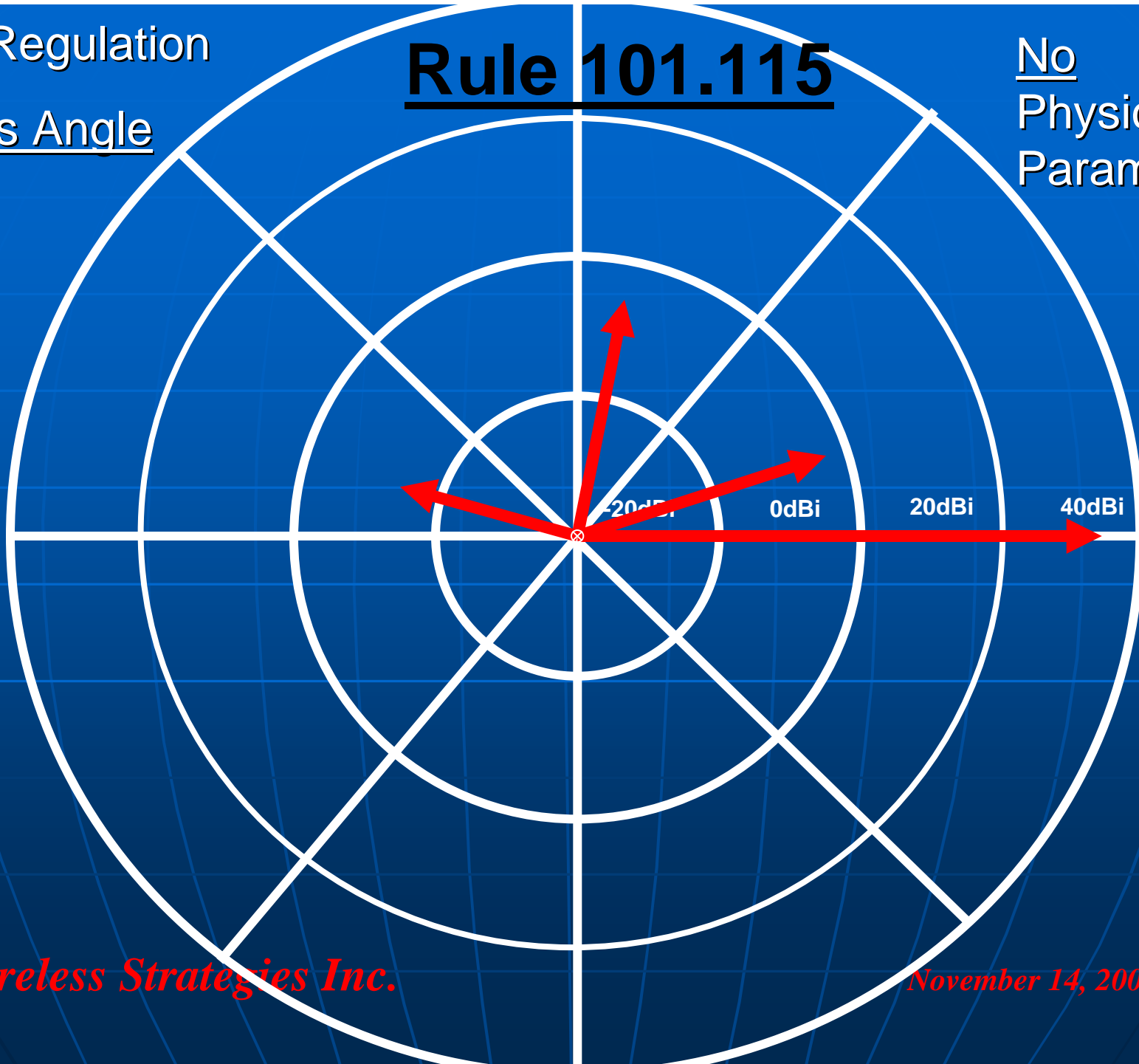
Rule 101.115



The Regulation
dBi vs Angle

Rule 101.115

No
Physical
Parameters



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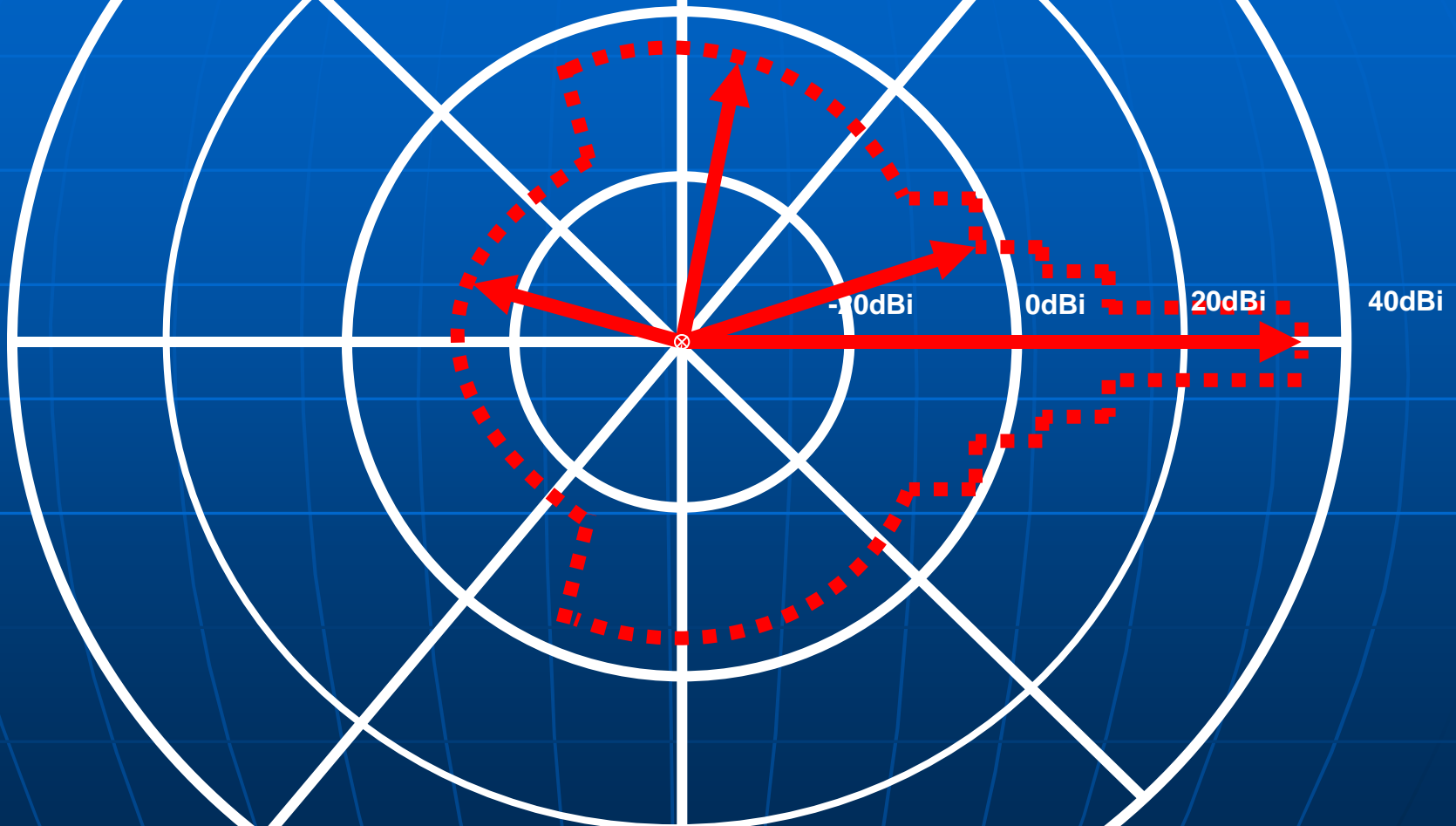
The Regulation

Cat A

dBi vs Angle

Rule 101.115

No
Physical
Parameters



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Facilitating Innovation

- ❖ Rule 101.115 specifies the antenna's Electrical Requirements (dBi vs Angle) and therefore the characteristics of the radiated signal (EIRP).
- ❖ Rule 101.115 does not specify an antenna's physical characteristics nor how the Electrical Requirements are met*

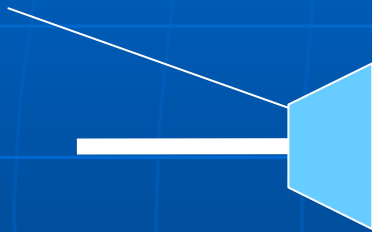
** By not specifying HOW, the Commission allows and encourages industry to innovate.*

Rule 101.115

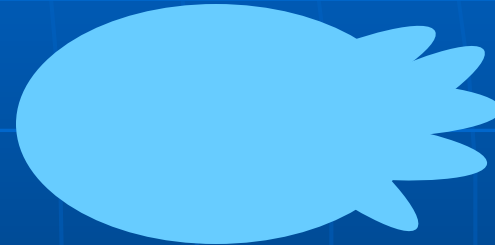
Antenna Radiating Elements Not Specified

Feed Horn with Convex Reflector

Physical Location Not Specified



RPE Not Specified



Dipole

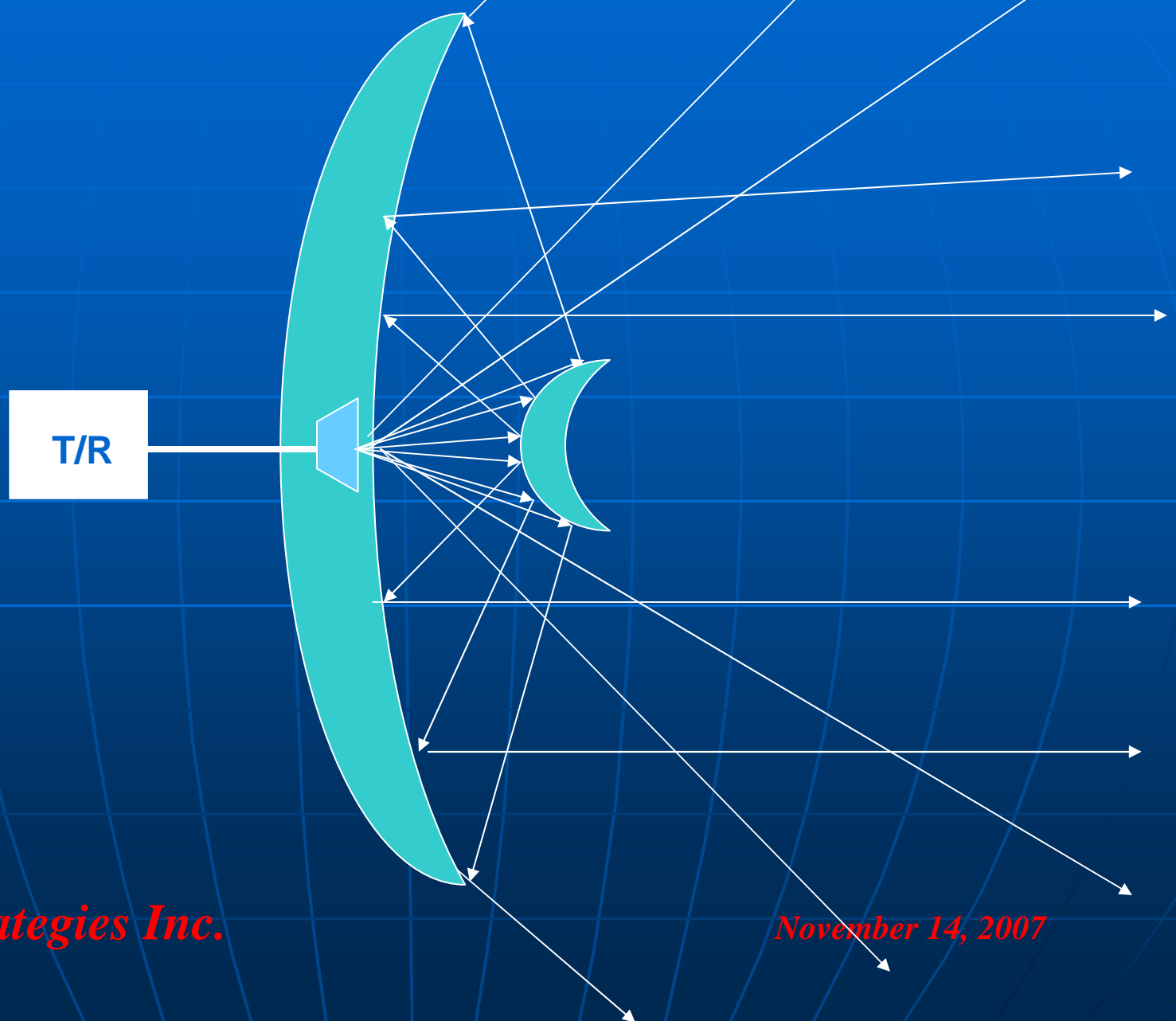
Physical Location Not Specified



RPE Not Specified



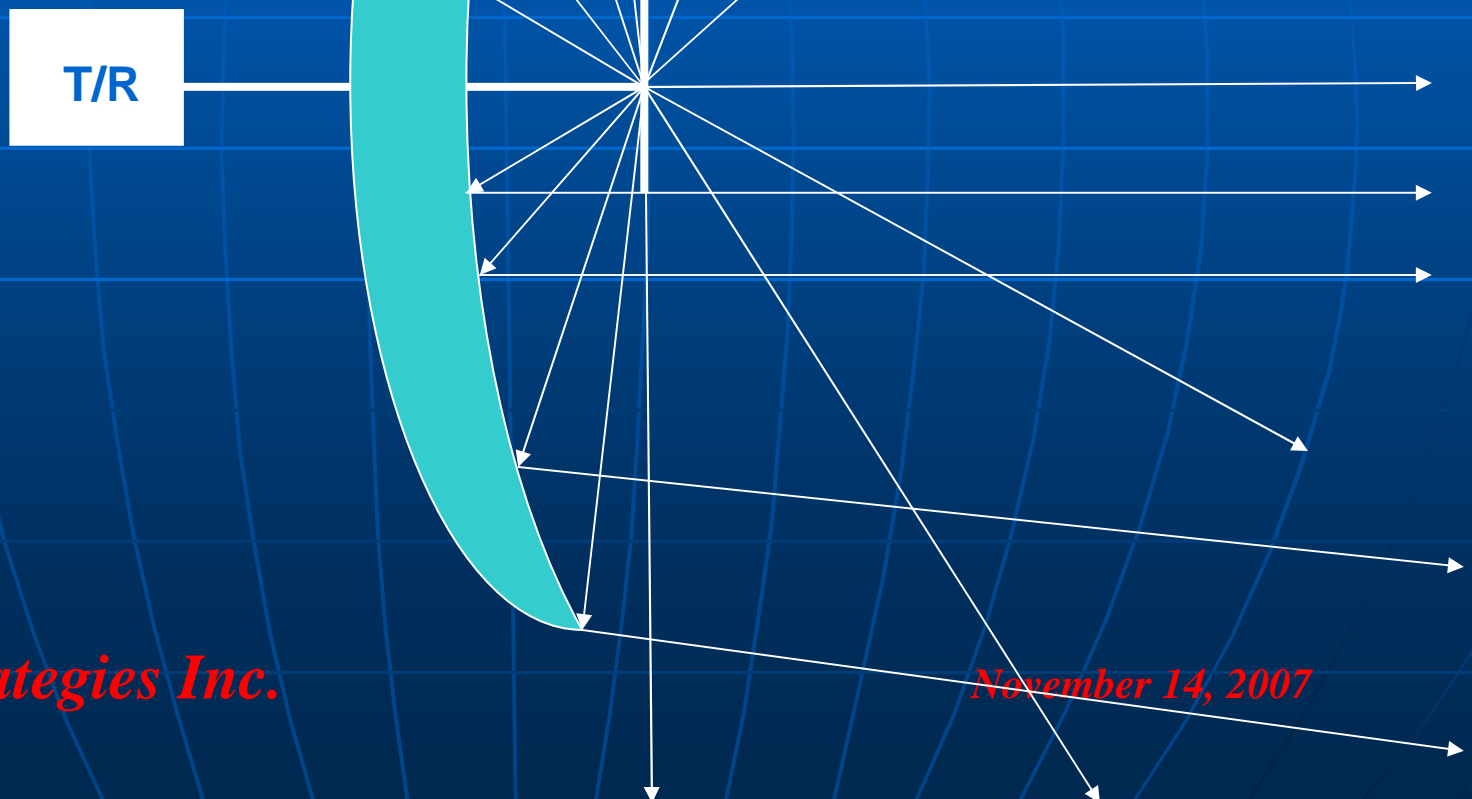
Parabolic Dish with Feed Horn and Convex Reflector



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Parabolic Dish with Dipole



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Transceiver and Radiator Element's Location and RPE Not Specified for a Dish Antenna



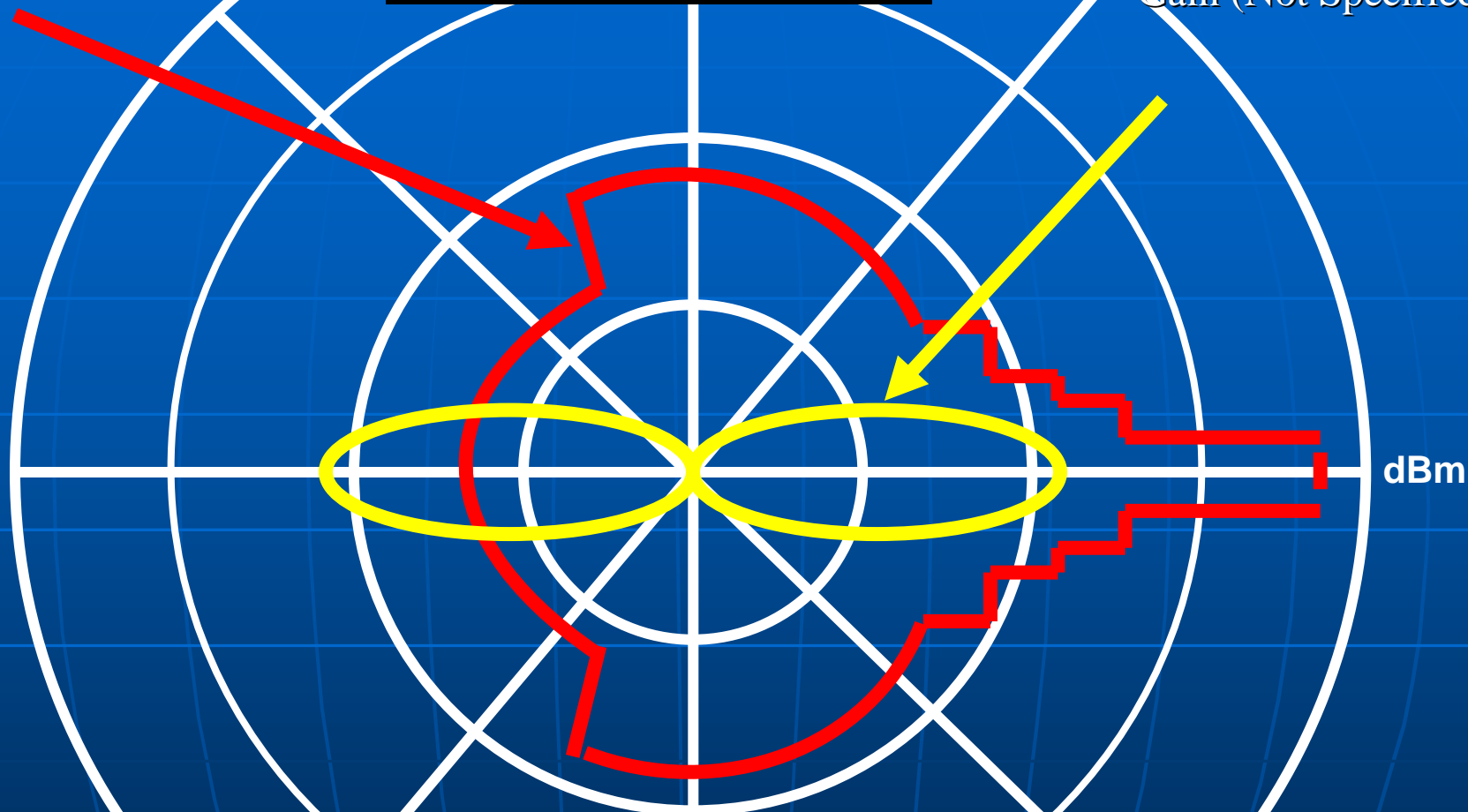
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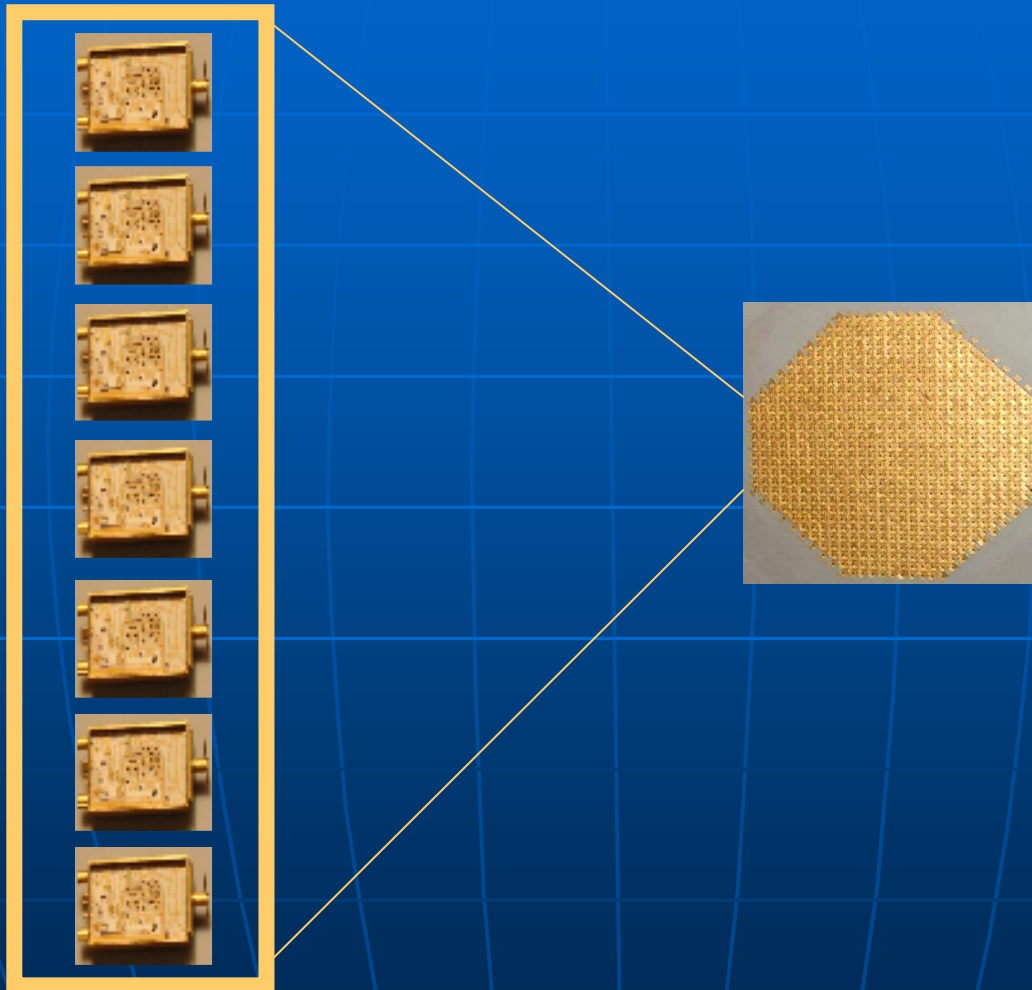
Coordinated EIRP

Dish Antenna

Stand alone Radiation
Element EIRP. Dipole
Gain (Not Specified)



Transceiver and Radiator Element's Location and RPE Not Specified for a Multi-Array Antenna



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Coordinated EIRP

Multi-Array Antenna With DREs

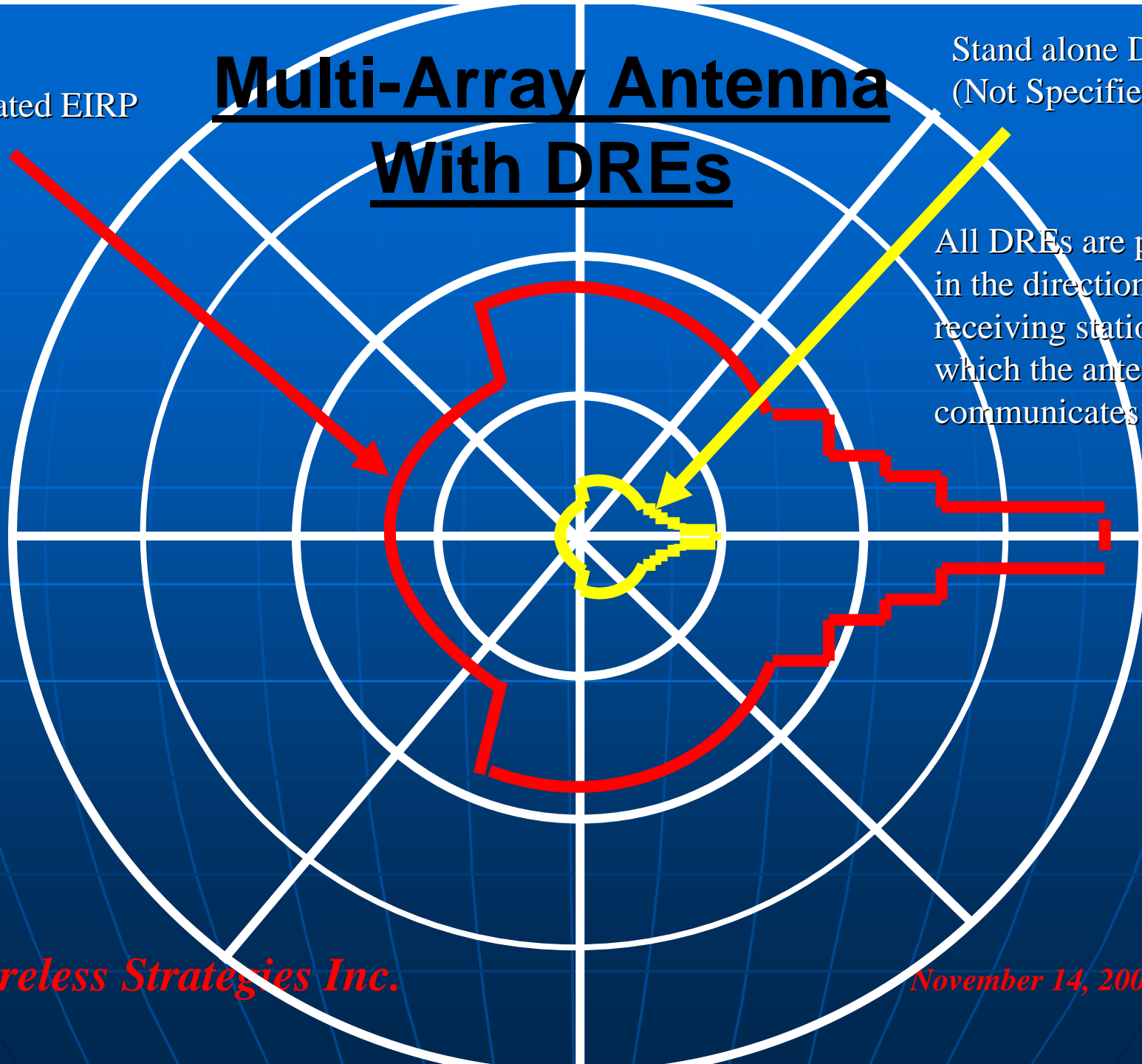
Stand alone DRE EIRP
(Not Specified)

All DREs are pointed
in the direction of the
receiving station with
which the antenna
communicates

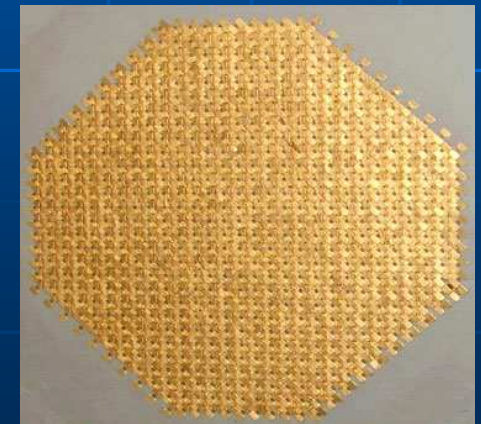
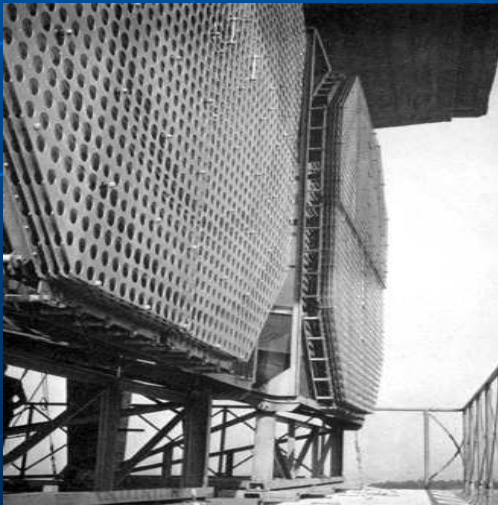
dBm

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Any Type of Antenna
that meets Rule 101.115 is Allowed



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Rule 101.115

❖ **WSI's Request for a Declaratory Ruling Requires that Antennas with DREs Must Meet Rule 101.115.**

❖ **Antennas with DREs Do Meet Rule 101.115**

Part 101

Frequency Coordination Procedures (Rule 101.103) and Interference Calculations (TSB10, Section 3)

Wireless Strategies Inc.

November 14, 2007

Items used for Notification and to Complete Form 601 (The same for a parabolic dish or a smart antenna with Distributed Radiating Elements)

to resolve technical problems and conflicts that may inhibit the most effective and efficient use of the radio spectrum; however, the party being coordinated with is not obligated to suggest changes or re-engineer a proposal in cases involving conflicts. Applicants should make every reasonable effort to avoid blocking the growth of systems as prior coordinated. The applicant must identify in the application all entities with which the technical proposal was coordinated. In the event that technical problems are not resolved, an explanation must be submitted with the application. Where technical problems are resolved by an agreement or operating arrangement between the parties that would require special procedures be taken to reduce the likelihood of interference in excess of permissible levels (such as the use of artificial site shielding) or would result in a reduction of quality or capacity of either system, the details thereof may be contained in the application.

(2) Coordination procedure guidelines are as follows:

(i) Coordination involves two separate elements: notification and response. Both or either may be oral or in written form. To be acceptable for filing, all applications and major technical amendments must certify that coordination, including response, has been completed. The names of the licensees, permittees and applicants with which coordination was accomplished must be specified. If such notice and/or response is oral, the party providing such notice or response must supply written documentation of the communication upon request.

(ii) Notification must include relevant technical details of the proposal. At a minimum, this should include, as applicable, the following:

- Applicant's name and address.
- Transmitting station name.
- Transmitting station coordinates.
- Frequencies and polarizations to be added, changed or deleted.
- Transmitting equipment type, its stability, actual output power, emission designator, and type of modulation (loading).
- Transmitting antenna type(s), model, gain and, if required, a radiation pattern provided or certified by the manufacturer.

- Transmitting antenna center line height(s) above ground level and ground elevation above mean sea level.
- Receiving station name.
- Receiving station coordinates.
- Receiving antenna type(s), model, gain, and, if required, a radiation pattern provided or certified by the manufacturer.
- Receiving antenna center line height(s) above ground level and ground elevation above mean sea level.
- Path azimuth and distance.
- Estimated transmitter transmission line loss expressed in dB.
- Estimated receiver transmission line loss expressed in dB.
- For a system utilizing ATPC, maximum transmit power, coordinated transmit power, and nominal transmit power.

NOTE: The position location of antenna sites shall be determined to an accuracy of no less than ± 1 second in the horizontal dimensions (latitude and longitude) and ± 1 meter in the vertical dimension (ground elevation) with respect to the National Spatial Reference System.

(iii) For transmitters employing digital modulation techniques, the notification should clearly identify the type of modulation. Upon request, additional details of the operating characteristics of the equipment must also be furnished;

(iv) Response to notification should be made as quickly as possible, even if no technical problems are anticipated. Any response to notification indicating potential interference must specify the technical details and must be provided to the applicant, in writing, within the 30-day notification period. Every reasonable effort should be made by all applicants, permittees and licensees to eliminate all problems and conflicts. If no response to notification is received within 30 days, the applicant will be deemed to have made reasonable efforts to coordinate and may file its application without a response;

(v) The 30-day notification period is calculated from the date of receipt by the applicant, permittee, or licensee being notified. If notification is by mail, this date may be ascertained by:

- (A) The return receipt on certified mail;
- (B) The enclosure of a card to be dated and returned by the recipient; or
- (C) A conservative estimate of the time required for the mail to reach its

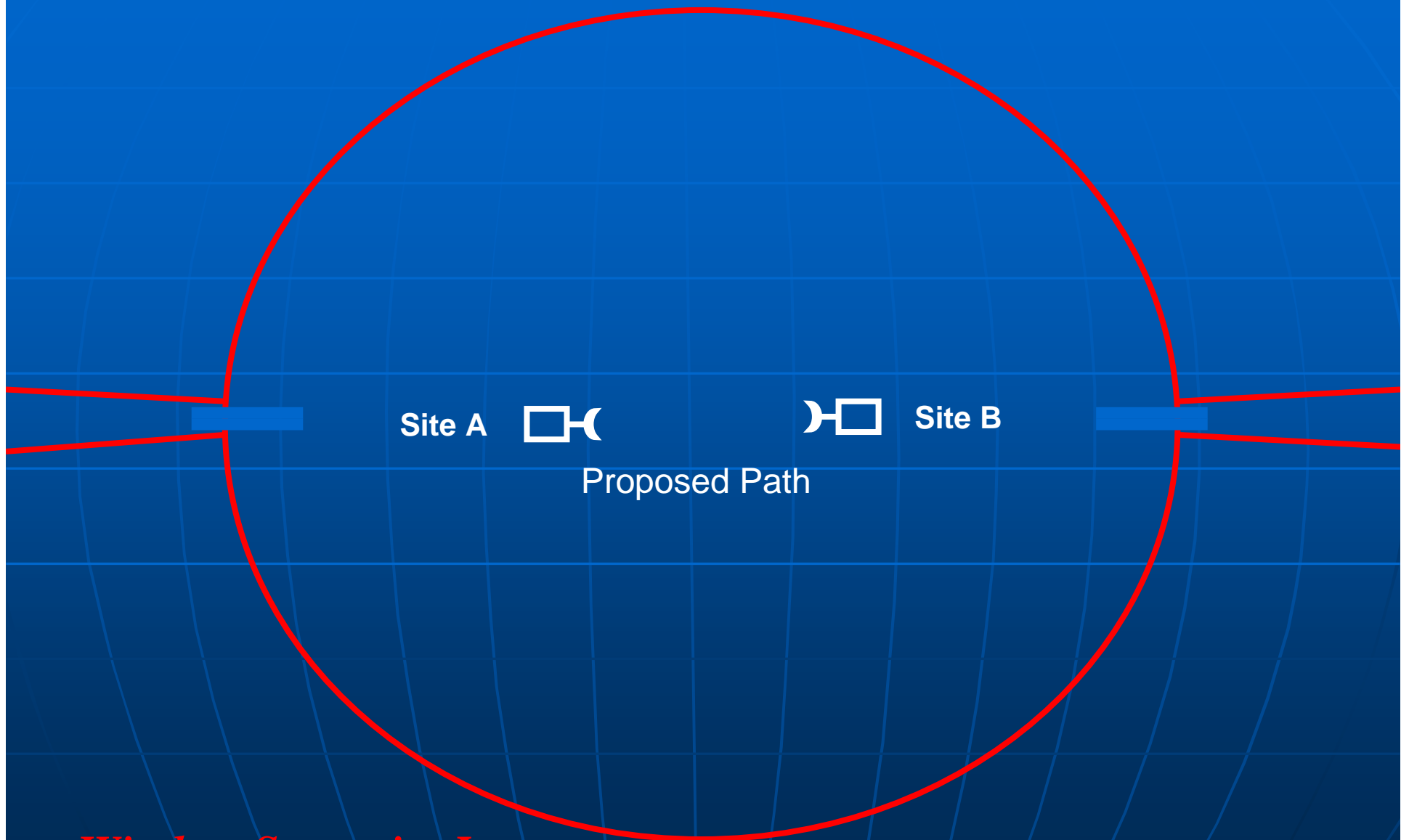
Rule 101.103/TSB10

- ❖ Coordination for terrestrial microwave systems uses a circular coordination contour with a radius¹ sector extending 400km² within 5 degrees on either side of the antenna main beam and a radius of 200km² for the remaining 350 degrees.
- ❖ This means that the antenna side lobes are coordinated at the same time (concurrently) with the main lobe
- ❖ This also means that over 97% of the coordination is for the antenna side lobes
- ❖ For legacy paths the side lobes are unused, resulting in the inefficient use of exclusive-use spectrum

1. These radii are referred to as the circular coordination distance.

2. For freq above 15GHz, 140km and 75km respectively

Prior Coordination Boundary



Over 97% of the coordination
is for the antenna side lobes

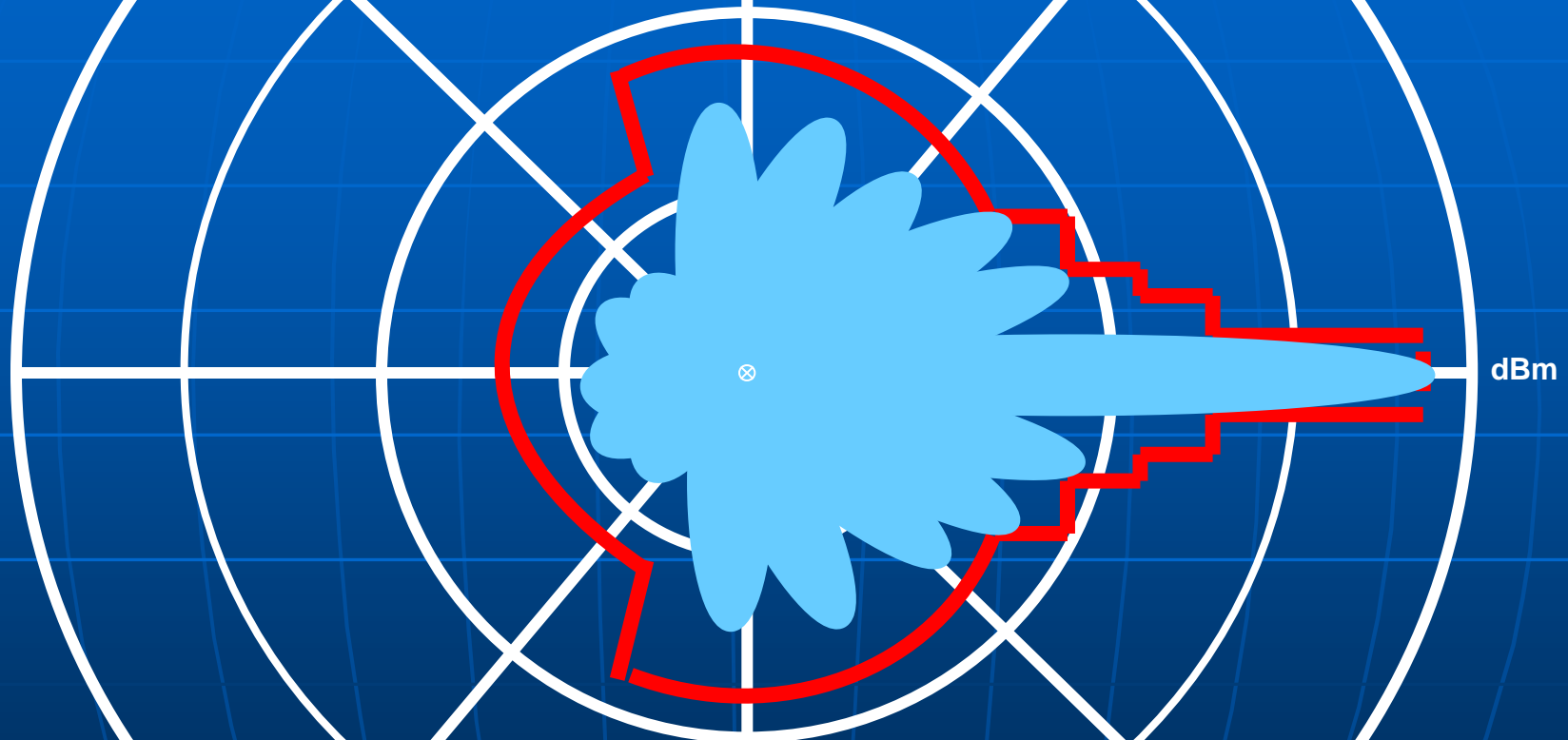
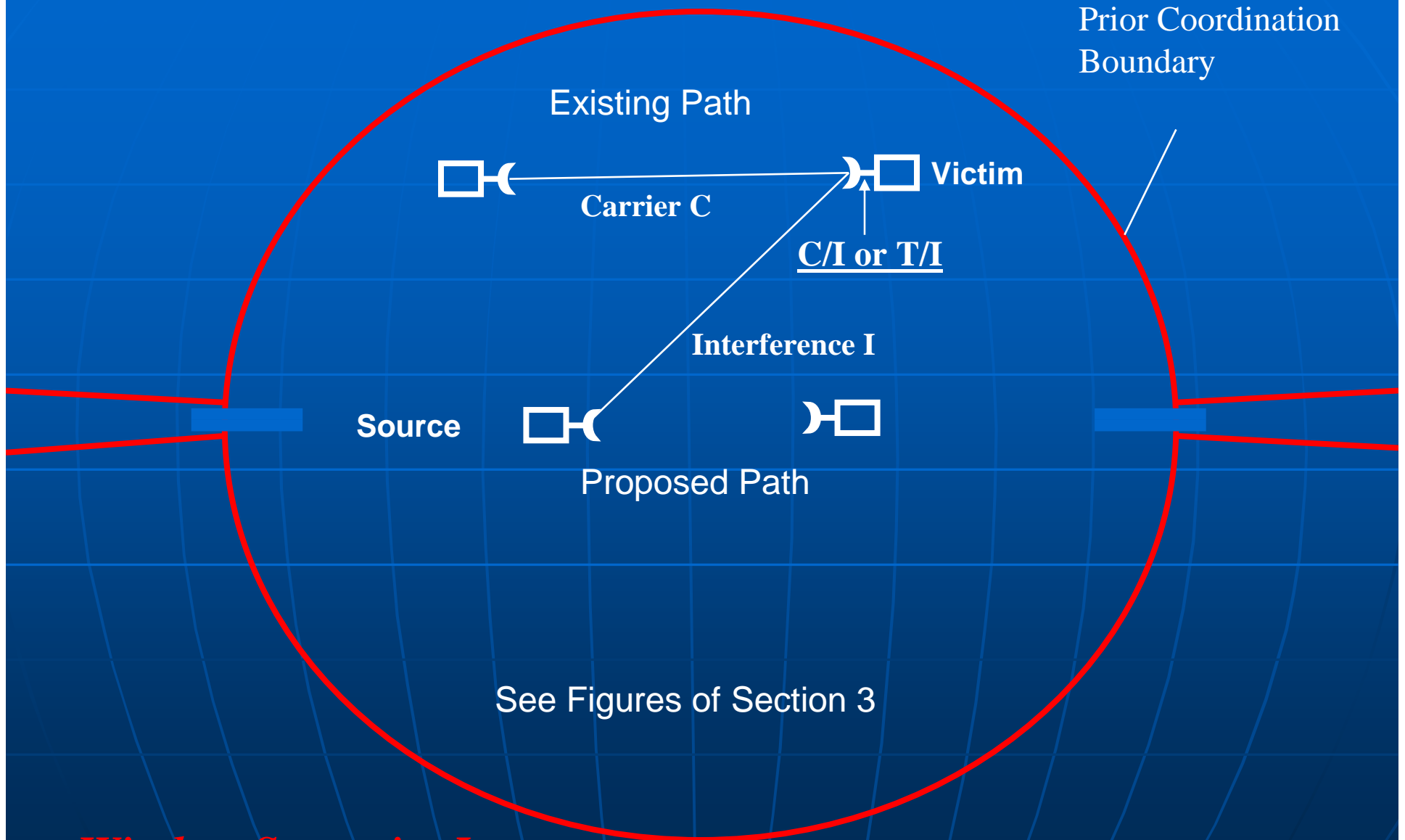


Diagram Per TSB10



**Log Polar Plot Requirement of the EIRP
for Any Type of Std A Requirement Antenna**

Wireless Strategies Inc. *November 14, 2000*

dBm

**Linear Distance Plot of the Interference Contour
for Any Type of Std A Antenna**
(For a given Victim receiver antenna gain)

Victim Antenna Main Lobe 10 deg
off Interference Source Antenna
Ctr Line

Victim Antenna Main Lobe 20 deg
off Interference Source Antenna
Ctr Line

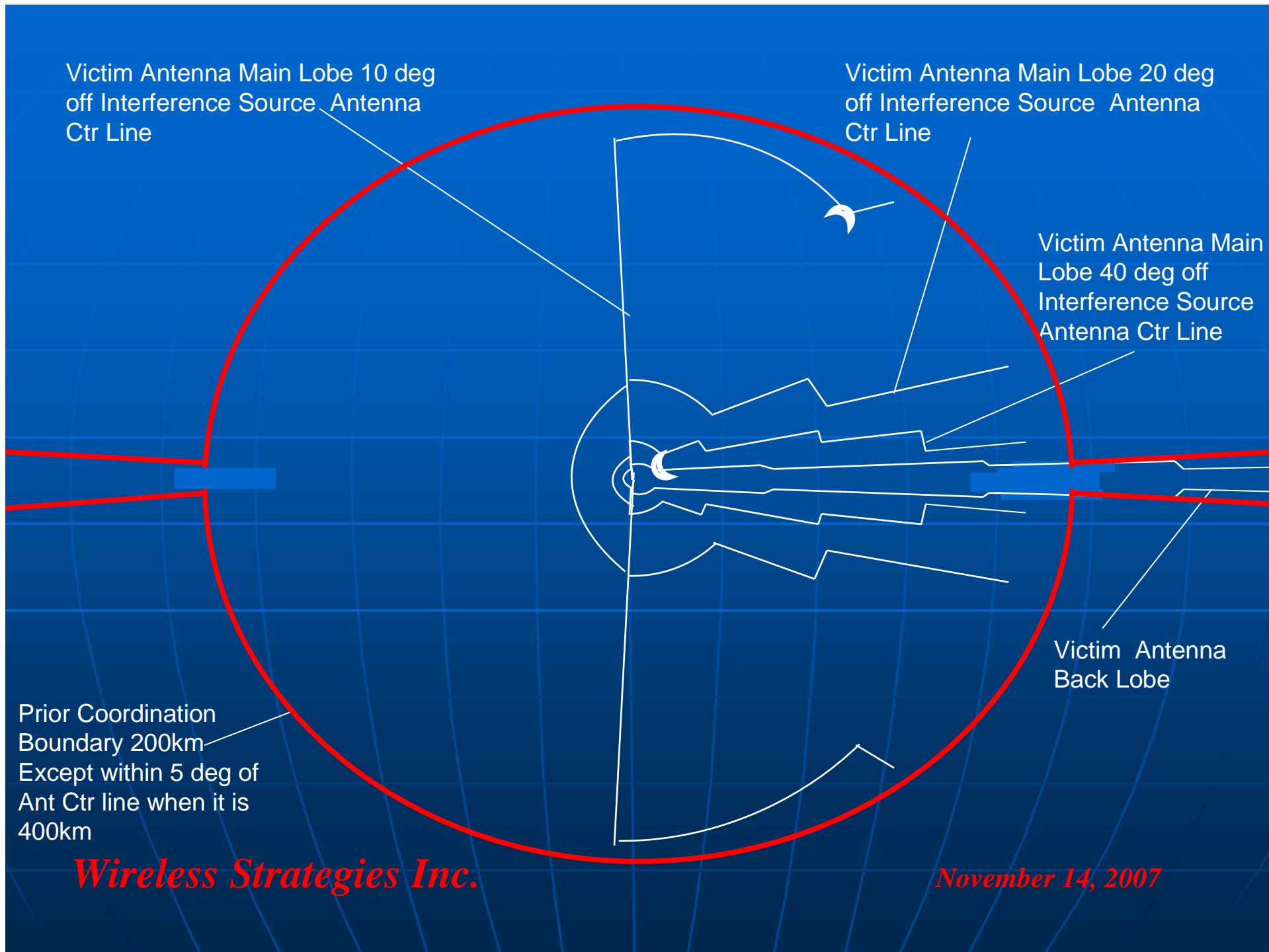
Victim Antenna Main
Lobe 40 deg off
Interference Source
Antenna Ctr Line

Victim Antenna
Back Lobe

Prior Coordination
Boundary 200km
Except within 5 deg of
Ant Ctr line when it is
400km

Wireless Strategies Inc.

November 14, 2007



Smart Antenna with Distributed Radiators*

$$I_{\text{DRE}} < I$$

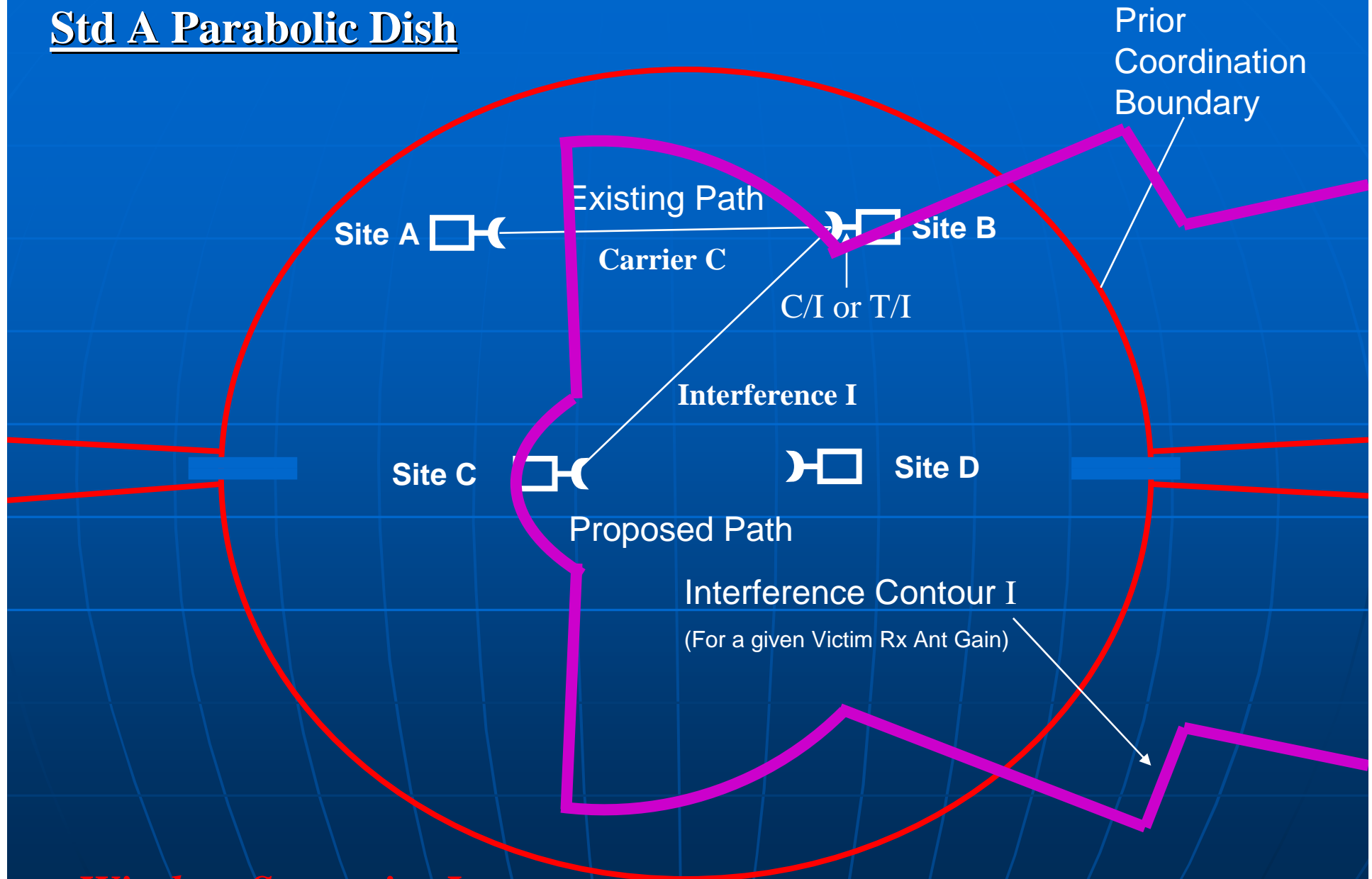
or

$$I_{\text{DRE}} < \text{Victim Rx Thermal Noise} - 6\text{dB}$$

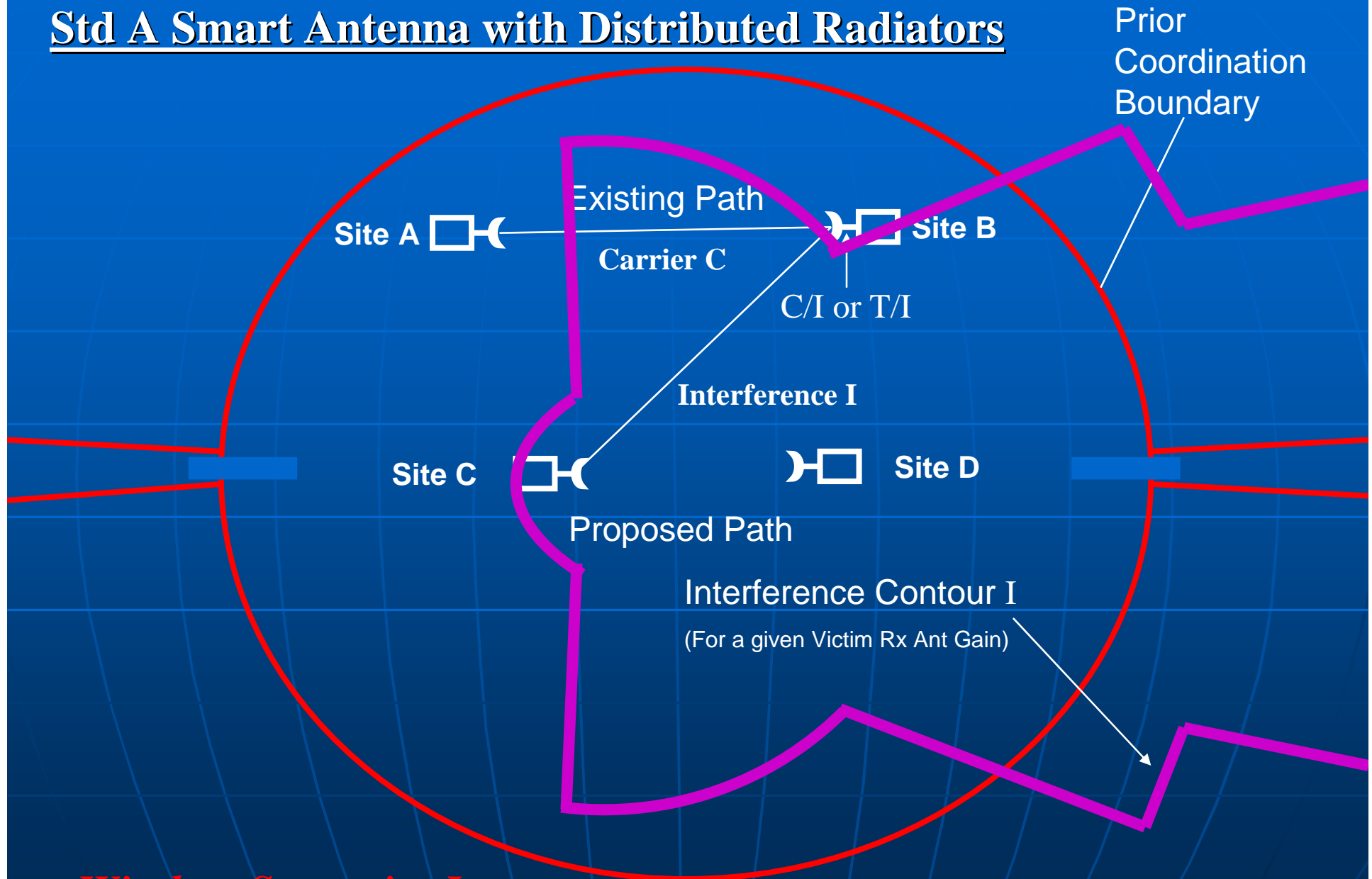
Therefore a DRE can NOT cause harmful Interference

* Only I or I_{DRE} is on at any one time.

Std A Parabolic Dish



Std A Smart Antenna with Distributed Radiators



F_{1a} **F_{1b}**

Linear Distance Plot of the Interference Contour Around Sites C and D for a Std A Dish Antenna (For a given Victim receiver antenna gain)

I = -100dBm

F_{1a} F_{1b}

Linear Distance Plot of the Interference Contour Around Sites C and D
for a Smart Antenna with Distributed Radiating Elements
(For a given Victim receiver antenna gain)

$I = -100\text{dBm}$

F_{1a} F_{1b}

Linear Distance Plot of the Interference Contour Around Sites C and D
for a Smart Antenna with Distributed Radiating Elements
(For a given Victim receiver antenna gain)

$I = -100\text{dBm}$

F_{1a} **F_{1b}**

Linear Distance Plot of the Interference Contour Around Sites C and D for a Smart Antenna with Distributed Radiating Elements (For a given Victim receiver antenna gain)

I = -100dBm



F_{1a} F_{1b}

**Linear Distance Plot of the Interference Contour
for Any Type of Std A Antenna for Both Ends of the Path**
(For a given Victim receiver antenna gain)

Legacy Network

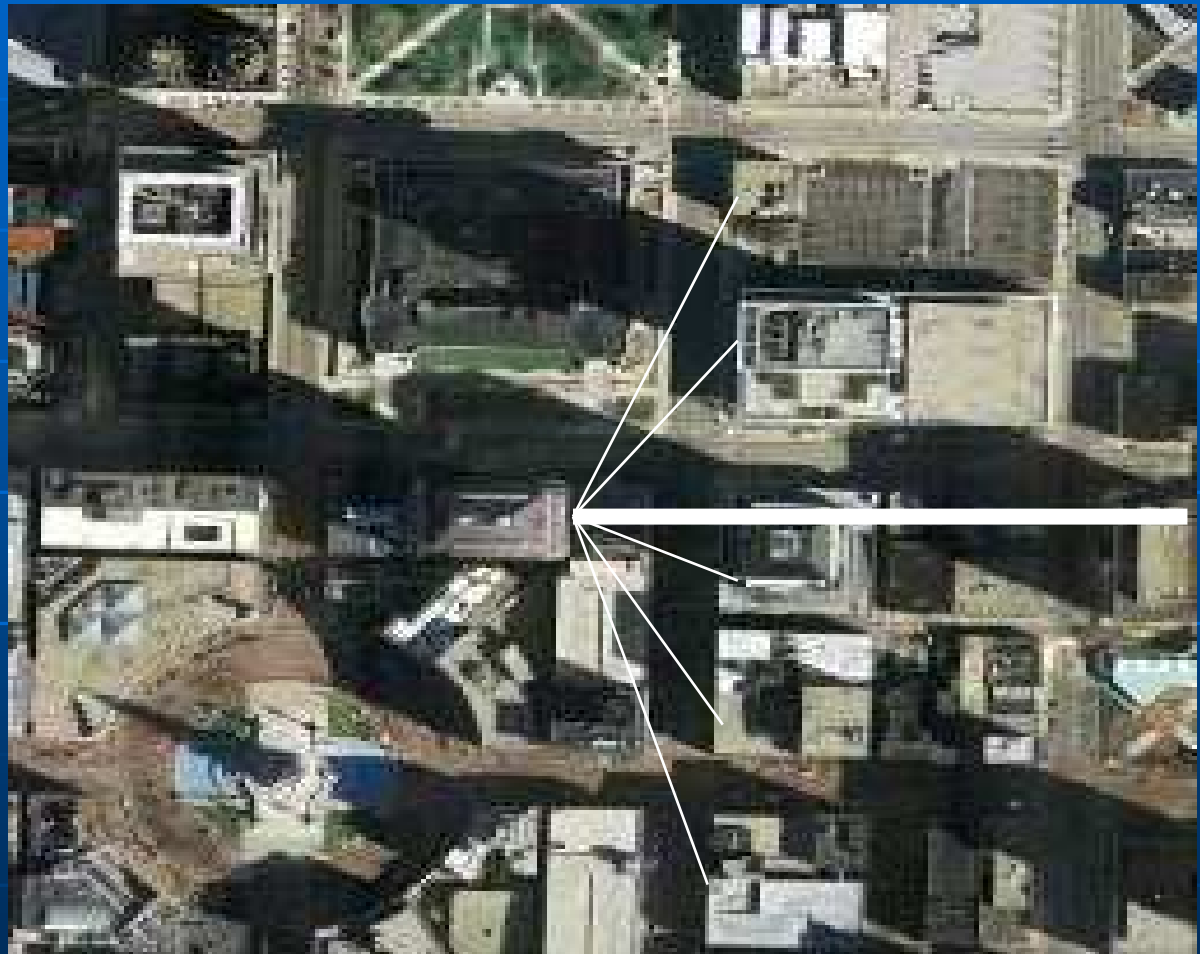
Everything Required
to perform a
Coordination Study is known

Concurrently Coordinated Network

Everything Required
to perform a
Coordination Study
and to
Maintain $I_{DRE} < I$
is known

Effective Use of Spectrum

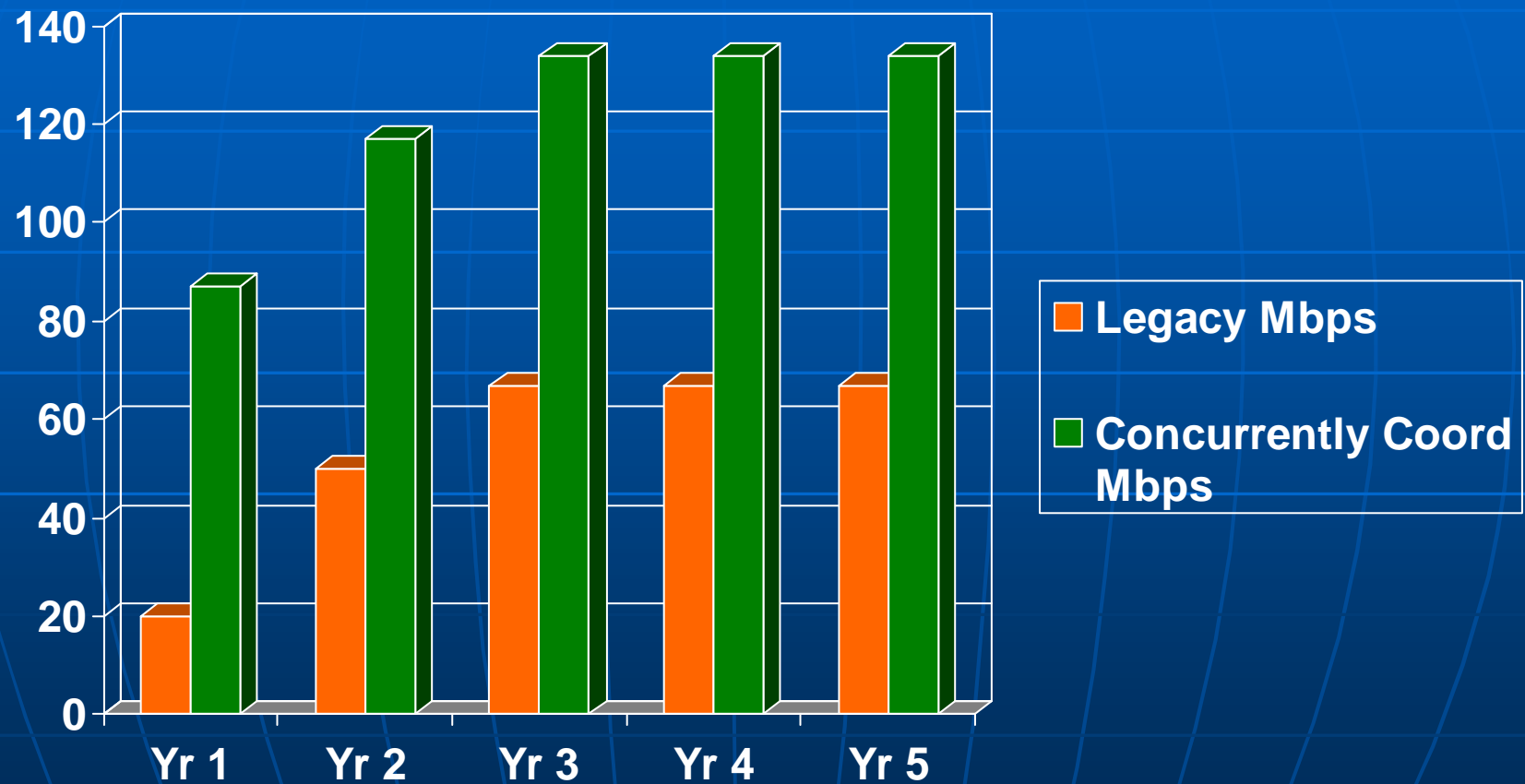
Spectrum Reused Multiple Times, without Causing Harmful Interference, to Provide Un-served Locations with Low Cost Broadband Services



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November 14, 2007

Effective Use of Spectrum



TSB10 Coordination Examples

Wireless Strategies Inc.

November 14, 2007